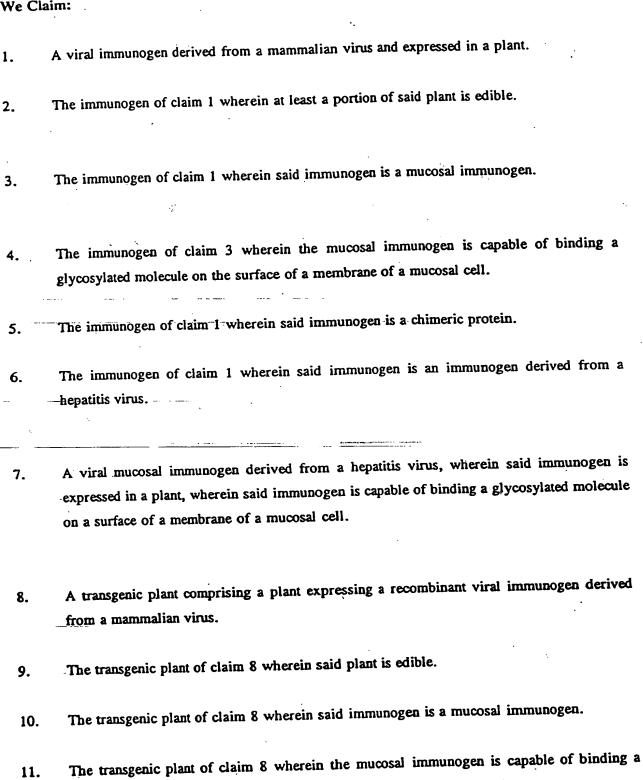


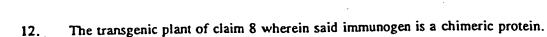
CLAIMS

We Claim:

11.



glycosylated molecule on the surface of a membrane of a mucosal cell.



- 13. The transgenic plant of claim 8 wherein said immunogen is an immunogen derived from a hepatitis virus.
- 14. A transgenic plant expressing a recombinant viral mucosal immunogen of hepatitis virus, wherein said mucosal immunogen is capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell.
- 15. A vaccine comprising a recombinant viral immunogen expressed in a plant.
- 16. The vaccine of claim 15 wherein said immunogen is a mucosal immunogen.
- 17. The vaccine of claim 15 wherein the mucosal immunogen is capable of binding a glycosylated molecule on the surface of a membrane of a mucosal cell.
- 18. The vaccine of claim 14 wherein said immunogen is a chimeric protein.
- 19. The vaccine of claim 14 wherein said immunogen is an immunogen derived from a hepatitis virus.
- 20. A vaccine comprising a mucosal immunogen of hepatitis virus expressed in a plant, wherein said mucosal immunogen is capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell.
- 21. A food comprising at least a portion of a transgenic plant capable of being ingested for its nutritional value, said plant comprising a plant expressing a recombinant viral immunogen.
- 22. The food of claim 21 wherein said immunogen is a mucosal immunogen.
- 23. The food of claim 21 wherein the mucosal immunogen is capable of binding a glycosylated molecule on the surface of a membrane of a mucosal cell.
- 24. The food of claim 21 wherein said immunogen is a chimeric protein.



- 25. The food of claim 21 wherein said immunogen is an immunogen derived from a hepatitis virus.
- 26. A food comprising at least a portion of a transgenic plant capable of being ingested for its nutritional value, said plant expressing a recombinant viral mucosal immunogen of hepatitis virus, wherein said mucosal immunogen is capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell.
- 27. The food of any of claims 21-26 wherein said plant portion includes the fruit, leaves, stems, roots, or seeds of said plant.
- 28. A plasmid vector for transforming a plant comprising:
 - a DNA sequence encoding a viral immunogen; and
 - a plant-functional promoter operably linked to said DNA sequence capable of directing the expression of said immunogen in said plant.
- 29. The plasmid vector of claim 28 further comprising a selectable or scorable marker gene.
- 30. —The plasmid vector of claim 28 wherein said plant promoter comprises CaMV35S.
- 31. The plasmid vector of claim 28 wherein said plant is edible.
- 32. The plasmid vector of claim 28 wherein said immunogen is a mucosal immunogen.
- 33. The plasmid vector of claim 28 wherein the mucosal immunogen is capable of binding a glycosylated molecule on the surface of a membrane of a mucosal cell.
- 34. The plasmid vector of claim 28 wherein said immunogen is a chimeric protein.
- 35. The plasmid vector of claim 28 wherein said immunogen is an immunogen derived from a hepatitis virus.
- 36. A plasmid vector for transforming a plant comprising:
 - a DNA sequence encoding a mucosal immunogen of hepatitis virus, said mucosal immunogen capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell; and

- a plant-functional promoter operably linked to said DNA sequence capable of directing the expression of said immunogen in said plant.
- A DNA fragment useful for microparticle bombardment transformation of a plant comprising: 37.
 - a DNA sequence encoding a viral immunogen; and
 - a plant-functional promoter operably linked to said DNA sequence capable of directing the expression of said immunogen in said plant.
- The DNA fragment of claim 37 further comprising a selectable or scorable marker gene. 38.
- The DNA fragment of claim 37 wherein said plant promoter comprises CaMV35S. 39.
- The DNA fragment of claim 37 wherein said plant is edible. 40.
- The DNA fragment of claim 37 wherein said immunogen is a mucosal immunogen. 41.
- The DNA fragment of claim 37 wherein the mucosal immunogen is capable of binding a 42. glycosylated molecule on the surface of a membrane of a mucosal cell.
- The DNA fragment of claim 37 wherein said immunogen is a chimeric protein. 43.
- The DNA fragment of claim 37 wherein said immunogen is an immunogen derived from a 44. hepatitis virus.
- A DNA fragment for ballistically transforming a plant comprising: 45.
 - a DNA sequence encoding a mucosal immunogen of hepatitis virus, said mucosal immunogen capable of binding a glycosylated molecule on a surface of a membrane of a mucosai cell; and
 - a plant-functional promoter operably linked to said DNA sequence capable of directing the expression of said immunogen in said plant.
- A method for constructing a transgenic plant cell comprising the steps of: 46.

constructing a plasmid vector or a DNA fragment by operably linking a DNA sequence encoding a viral immunogen to a plant-functional promoter capable of directing the expression of said immunogen in said plant; and

transforming a plant cell with said plasmid vector or DNA fragment.



- 47. The method of claim 46 further comprising the step of;
 regenerating a transgenic plant from said transgenic plant cell.
- 48. A method for producing a vaccine comprising the steps of:

constructing a plasmid vector or a DNA fragment by operably linking a DNA sequence encoding a viral immunogen to a plant-functional promoter capable of directing the expression of said immunogen in said plant;

transforming a plant cell with said plasmid vector or DNA fragment; and recovering said immunogen expressed in said plant cell for use as a vaccine.

49. The method of claim 48 further comprising the step of;

prior to recovering said immunogen for use as a vaccine, regenerating a transgenic plant from said transgenic plant cell.

- 50. The method of claim 48 wherein said recovery step further comprises obtaining an extract of said plant cell.
- 51. The method of claim 49 wherein said recovery step further comprises harvesting at least a portion of said transgenic plant.
- 52. The method of claim 48 wherein said plant cell is transformed utilizing an Agrobacterium system.
- 53. The method of claim 52 wherein said <u>Agrobacterium</u> system is an <u>Agrobacterium</u> tumefaciens-Ti plasmid system.
- 54. The method of claim 48 wherein said plant cell is transformed utilizing a microparticle bombardment transformation system.
- 55. The method of claim 48 wherein said DNA sequence is a DNA sequence encoding a hepatitis virus immunogen.
- 56. The method of claim 48 wherein said plant is a tomato plant.
- 57. The method of claim 48 wherein said plant is a tobacco plant.



- 58. The method of claim 48 wherein said plasmid vector is a binary vector.
- 59. The method of claim 48 wherein said plasmid vector is an integrative vector.
- 60. The method of claim 48 wherein said plasmid vector is pB121.
- 61. The method of claim 48 wherein said plant cell is transformed by microinjection.
- 62. The method of claim 48 wherein said plant cell is transformed by polyethylene glycol mediated uptake.
- 63. The method of claim 48 wherein said plant cell is transformed by electroporation.
- 64. The method of claim 48 wherein said plant cell is transformed by microparticle bombardment.
- 65. The method of claim 48 wherein said plant cell is a cell of a dicotyledon.
- 66. The method of claim 48 wherein said plant cell is a cell of a monocotyledon.
- 67. A method of administering any of the vaccines of claims 15-20 comprising administering a therapeutic amount of said vaccine to a mammal.
- 68. The method of claim 67 wherein the administering of a vaccine further comprises a parenteral introduction of said vaccine into said mammal.
- 69. The method of claim 67 wherein the administering of a vaccine further comprises a nonparenteral introduction of said vaccine into said mammal.
- 70. The method of claim 69 wherein said non-parenteral introduction of said vaccine into said mammal further comprises an oral introduction of said vaccine into said mammal.
- 71. A method of administering an edible portion of a transgenic plant, which transgenic plant expresses a recombinant viral immunogen, to a mammal as an oral vaccine against a virus from which said immunogen is derived, comprising:

harvesting at least an edible portion of said transgenic plant; and



feeding said harvested portion of said transgenic plant to a mammal in a suitable amount to be therapeutically effective as an oral vaccine in the mammal.

72. A method of producing and administering an oral vaccine, comprising the steps of:

constructing a plasmid vector or DNA fragment by operably linking a DNA sequence encoding a viral immunogen to a plant-functional promoter capable of directing the expression of said immunogen in a plant;

transferring the plasmid vector into a plant cell;

regenerating a transgenic plant from said cells;

harvesting an edible portion of said regenerated transgenic plants; and

feeding said edible portion of said plant to a mammal in a suitable amount to be therapeutically effective as an oral vaccine.